

# TRACKER Network IoT Solution

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## 1 Abstract

IoT describes a wide area of services and solutions that split into several solution categories, private or public network, short or long range, data throughput and energy consumption. Each solution has its own merits and of course its weaknesses. TRACKER IoT is operating on a private VHF network with an inherited long-range capability and very low energy consumption, is an ideal solution for critical applications that rely on secure, reliable and manageable network with a short and very long-range requirements.

## 2 Problem Statement

There are several IoT solutions that can provide, on paper the same services, but each one would have a compromise, either on data range, power consumption, battery life, network availability, cost of device, operational and deployment cost.

Public networks lack on network stability as there isn't a single network regulator to manage the connected devices and their activity, therefore there is a potential issue with network reliability due to network overcrowd from different devices.

Data range, power consumption and base network frequency are interrelated; so, higher the base frequency, lower the range and higher the power consumption. This influences device cost and years in service when self-powered.

Operational cost is directly related to the network infrastructure and connected devices. Higher the base frequency, lower the operational range and higher the cost of deployment as more base stations are needed. Especially an issue when base network frequency is not available at deployment area, the cost of setup prohibits the relative cost of the device unless the volumes and years in service make financial sense.

Energy demand would of course depend on uplink and downlink active time, distance to and from network tower, network base frequency and associated accessories connected to the device. Device form factor depends on antenna requirement, electronic module size, years in operation needed (onboard stored energy for autonomous systems).

### 3 Background

IoT systems can be separated by their functions, like sensors, wearables, smart devices, data devices, IoT aggregators. Each system serves a purpose, each purpose has its own requirements and none of solutions can address all of the requirements efficiently.

The BLE (Bluetooth Low Energy) for example, is ideal for providing local information around their monitored sensor, i.e. temperature sensor within a room in a house provides room temperature at regular intervals to the host central heating unit; utilising a CR3220 coin cell battery which can last up to 12-months in operation. This is an ideal scenario of localised short-range network with several IoT devices that used to control and report the demands of automated systems. Equally this solution can't be deployed into wider area as the range ability is restricted due to base network frequency, power management and form factor requirements.

Sigfox, LoRa for example have the range capability for wider range area and are "free" from network licence, but would suffer from network reliability due to network overcrowd and would require deployment of a base network system. Form factor and energy requirement would not match the BLE, but would have better range to power transmission and would be an ideal candidate for sensor relay data.

NB-IoT and LTE-M, would benefit the managed licenced network in terms of data stability, would have equal form factor to the Sigfox and LoRa and equal range to power transmission. Network fees and managed network deployment can handicap this solution, as it may not be economically viable for the operator to deploy a network that is not utilised, so system depends on demand and priority for deployment as managed service.

### 4 Solution

TRACKER Network IoT solution utilises a licenced private managed network, a VHF and UHF base network frequencies for low power long-range solution. It has been in service for over 25 years and with UK population coverage of over 95%. This provides the ability for immediate plug and play IoT devices without the requirement of network upgrade or deployment, having the ability of effective range over 100km at 1kbit baud rate and with precise scheduled network downlink messages, the energy consumption is kept to minimum giving the device a very good form factor with long service life.

This makes the TRACKER Network IoT solution ideal for:

- Rural remote monitoring and/or command and control systems, by utilising the very long-range capability of base frequency and dual communications.
- Densely populated areas that require quick deployment with stable and reliable network for monitoring and/or command and control application,

by utilising our existing VHF mature network and base frequency ability to penetrate densely populated areas.

- Deployment of few devices at a time, utilising the existing mature network.
- Deployment at remote areas without any existing network coverage, like offshore windfarms, easily connected to onshore base stations due to very long network coverage.

## 5 Conclusion

Having the merits of licenced network, the low base frequency, already mature (over 25 years) UK network coverage, TRACKER Network IoT is a truly plug and play solution that can guarantee reliability of service, fast deployment and long-term service. The TRACKER Network IoT already comes with several form factors and capabilities.

Table below provides an insight on industry and application deployment of the TRACKER Network IoT solution.

App Type	Network	Industry Vertical	Application	Application Description
Mobile	VHF	Transport/Security	Stolen e-Bike/Bike Recovery	Detection and recovery of high value bikes following theft. Device is built into the frame of bike during manufacture. Can be combined with Bluetooth for proximity detection
Mobile	VHF	Transport	UBI - Pay as you drive	Remote monitoring of vehicle for distance travelled and locations visited
Mobile	VHF	Transport/Logistics	Cold Chain	Temperature monitoring of perishable goods in transit.
Static	400 MHz	Smart City	Parking	Detection of space occupancy using a surface mounted or buried sensor
Static	400 MHz	Smart City	Smart Street Lighting	Monitoring and active management of urban street lighting to optimise energy usage at different times of day and year
Static	400 MHz	Utilities/Smart City	Water Leak Detection	Remote monitoring of pipelines for detection of leaks
Static	400 MHz	Environmental	Air Quality Monitoring	Monitoring emissions of CO2, NO2 and other air pollutants
Combined	VHF/400MHz Combined	Transport/Logistics	Asset Tracking	In conjunction with sensors detecting temperature and movement, ideal for medical packages such as vaccines or other goods in transit away from power supplies

## 6 References

[www.defineinstruments.com](http://www.defineinstruments.com) --- [drastic-limitations-of-sigfox-lora.pdf](#)